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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/608,935	06/27/2003	Nicholas Grant Rasmussen	20567-023001	6976

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EXAMINER	
GUILL, RUSSELL L	
ART UNIT	**PAPER NUMBER**
2123	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/13/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/608,935	RASMUSSEN ET AL.	
	Examiner	Art Unit	
	Russ Guill	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 March 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 July 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3/26/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. This Office Action is in response to an Amendment filed March 26, 2007. Claims 1 - 4 have been examined. Claims 1 - 4 have been rejected.

2. The finality of the previous Office Action is withdrawn. PROSECUTION IS HEREBY REOPENED. New grounds of rejection are set forth below.

3. The indicated allowability of claims 1 - 4 is withdrawn in view of the newly discovered reference(s) to Stam and Da Vitoria Lobo. Rejections based on the newly cited reference(s) follow.

Response to Remarks

4. Regarding claims 1 - 4 rejected under 35 USC 101:

   a. Applicant's amendments to the claims overcome the rejection.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

a. Claims 1 - 4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

i. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: simulating movement of a plurality of elements. Although the preamble

recites a method of simulating movement of a plurality of elements, and the simulated movement is displayed, it is unclear where the simulated movement is calculated.

ii. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: simulating elements advecting through space. Although the preamble recites a method of simulating elements advecting through space, and the advecting is displayed, it is unclear where the simulating elements advecting through space is calculated.

iii. Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: simulating movement of a plurality of elements. Although the preamble recites a method of simulating movement of a plurality of elements, and the simulated movement is displayed, it is unclear where the simulated movement is calculated.

iv. Claim 3 is rejected based upon the rejection of its parent claim under 35 USC 112, second paragraph.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. **Claims 1 - 4** are rejected under 35 U.S.C. 103(a) as being unpatentable over Gamito (Manuel Gamito et al.; "Two-dimensional simulation of gaseous phenomena using vortex particles", 1995, Computer Animation and Simulation '95", Springer-Verlag, 14 unnumbered pages) in view of Stam (U.S. Patent Number 6,266,071).

a. The art of Gamito is directed to animation and visualization of turbulent gaseous fluids in two dimensions (*first page, Abstract*).

b. The art of Stam is directed to producing fluid-like animations (*Title and Abstract*).

c. The art of Gamito and the art of Stam are analogous art because they are both directed to fluid animations.

d. Regarding **claim 1**:

e. As an initial remark, an essential issue is that, under a broad interpretation, any 3D grid appears to be composed of 2D grids (see U.S. Patent Number 5,537,641, column 1, lines 40 - 45).

f. Gamito appears to teach:

i. Generating a 2D grid, each 2D grid having a plurality of grid points (*fifth page, figure 1*);

ii. Associating movement information with each 2D grid point (*fifth page, figure 1; and sixth page, top part of page down to equation 14; velocities are associated with each grid point*);

iii. Changing the movement information associated with the 2D grid points over a time period that includes discrete intervals (*fifth page, figure 1; and sixth page, top part of page down to equation 14; equation 14 shows a delta time increment, which would have made it obvious that the velocity was incremented in discrete intervals*);

iv. Advecting the plurality of elements through the region of 2D space using the movement information associated with the 2D grids (*fifth page, section 4 A Particle-Grid Model, first paragraph including bullet items; and figure 1;* ***also please note on the tenth page, section 8 Future Developments, first paragraph, the reference to the obvious extension to three-dimensions***);

v. Displaying the simulated movement of the plurality of elements (*first page, Abstract, first sentence; and fifth page, section 4, first paragraph including the bullet items, last bullet item*);

g. Gamito does not specifically teach (in ***bold italic underline***):

i. Generating a ***plurality of*** 2D grid***s***, each 2D grid having a plurality of grid points;

ii. ***Defining a region of 3D space using the 2D grids;***

iii. Advecting the plurality of elements through the region of 3D space using the movement information associated with the 2D grids;

h. Stam appears to teach:

i. Generating a plurality of 2D grids, each 2D grid having a plurality of grid points (*figure 4B; it would have been obvious that the 3D volume*

displayed in figure 4B was composed from 2D grids. It would have been obvious to the ordinary artisan that even each cell of the 3D volume is composed from 2D grids, where each face of the 3D volume cube is a 2D grid. ***Further, in a normal computer program, a 3D grid is made of 2D grids, as described in U.S. Patent Number 5,537,641, column 1, lines 40 - 45***);

ii. Defining a region of 3D space using the 2D grids (*figure 4B; it would have been obvious that a region of 3D space was defined using 2D grids*);

iii. Advecting the plurality of elements through the region of 3D space (*Abstract*);

i. The motivation to use the art of Stam with the art of Gamito would have been the multiple benefits recited in Stam including that the process of calculating velocity and scalar fields solutions of the Navier-Stokes equation is easy to implement (*column 3, lines 10 – 20, and Abstract*), and uses much larger time steps than conventional methods and thus obtaining a stable solver (*column 3, lines 10 – 20, and Abstract*), which would have been recognized as benefits by the ordinary artisan to save time.

j. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Stam with the art of Gamito to produce the claimed invention.

k. Regarding **claim 2**:

l. Gamito appears to teach:

i. Generating a 2D grid, each 2D grid having a plurality of grid points, each grid point having movement information (*fifth page, figure 1*);

ii. Displaying the advecting of the simulated elements (*first page, Abstract, first sentence; and fifth page, section 4, first paragraph including the bullet items, last bullet item*);

iii. For each element, determining movement information for an element based on the location of the element in the region of 2D space (*fifth page, figure 1; and sixth page, top part of page down to equation 14; velocities are associated with each grid point*); wherein the determination includes:

iv. Identifying points on the 2D grids that lie on both sides of the element at the location in the region of 2D space (*fifth page, figure 1 and section 4 A Particle Grid Model, and sixth page down to equation 14;* ***also please note on the tenth page, section 8 Future Developments, first paragraph, the reference to the obvious extension to three-dimensions***);

v. Determining movement information at the points on the 2D grids (*fifth page, figure 1 and section 4 A Particle Grid Model, and sixth page down to equation 14*);

vi. Interpolating between the movement information at the points on the 2D grids to determine element movement information for the element at the location in 2D space (*fifth page, figure 1 and section 4 A Particle Grid Model, and sixth page down to equation 14;* ***also please note on the tenth page, section 8 Future Developments, first paragraph, the reference to the obvious extension to three-dimensions***);

m. Gamito does not specifically teach (in ***bold italic underline***):

i. Generating a ***plurality of*** 2D grid***s***, each 2D grid having a plurality of grid points, each grid point having movement information.

ii. ***Defining a region of 3D space using the 2D grids;***

iii. ***Generating a plurality of elements in the region of 3D space, each element having a location;***

iv. For each element, determining movement information for an element based on the location of the element in the region of 3D space, wherein the determination includes:

v. Identifying points on the 2D grids that lie on both sides of the element at the location in the region of 3D space;

vi. Interpolating between the movement information at the points on the 2D grids to determine element movement information for the element at the location in 3D space;

n. Stam appears to teach:

i. 3D space (*figure 4B*).

ii. Generating a ***plurality of*** 2D grids (*figure 4B; it would have been obvious that a region of 3D space was defined using 2D grids*);

iii. Defining a region of 3D space using the 2D grids (*figure 4B; it would have been obvious that the 3D volume displayed in figure 4B was composed from 2D grids. It would have been obvious to the ordinary artisan that even each cell of the 3D volume is composed from 2D grids, where each face of the 3D volume cube is a 2D grid.* ***Further, in a normal computer program, a 3D grid is made of 2D grids, as described in U.S. Patent Number 5,537,641, column 1, lines 40 - 45***);

iv. Generating a plurality of elements in the region of 3D space, each element having a location (*figure 4B; it would have been obvious that each cube has an element in the center*);

o. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Stam with the art of Gamito to produce the claimed invention.

p. Regarding **claim 3**:

q. Gamito appears to teach:

i. The movement information includes a 2D vector (*sixth page, equation 13; it would have been obvious that the velocity vector was 2D because the grid was 2D*).

r. Regarding **claim 4**:

s. As an initial remark, an essential issue is that, under a broad interpretation, any 3D grid appears to be composed of 2D grids (see U.S. Patent Number 5,537,641, column 1, lines 40 - 45).

t. Gamito appears to teach:

i. A computing device to generate a 2D grid, each 2D grid having a plurality of grid points (*fifth page, figure 1*);

ii. movement information is associated with each 2D grid point, wherein the movement information associated with the 2D grid points of the 2D grid changes over a time period that includes discrete intervals (*fifth page, figure 1; and sixth page, top part of page down to equation 14; equation 14 shows a delta time increment, which would have made it obvious that the velocity was incremented in discrete intervals*);

iii. and advects the plurality of elements through the region of 2D space using the movement information associated with the 2D grids (*fifth page, section 4 A Particle-Grid Model, first paragraph including bullet items; and figure 1; **also please note on the tenth page, section 8 Future Developments, first paragraph, the reference to the obvious extension to three-dimensions***) and displays the simulated movement of the plurality of elements (*first page, Abstract*).

u. Gamito does not specifically teach (in ***bold italic underline***):

i. A computing device to generate a ***plurality of*** 2D grid***s***, each 2D grid having a plurality of grid points,

ii. movement information is associated with each 2D grid point, wherein the movement information associated with the 2D grid points of the 2D grid***s*** changes over a time period that includes discrete intervals,

iii. ***the computing device also defines a region of 3D space using the 2D grids***, and advects the plurality of elements through the region of 3D space using the movement information associated with the 2D grid***s*** and displays the simulated movement of the plurality of elements.

v. Stam appears to teach:

i. A computing device to generate a ***plurality of*** 2D grid***s***, each 2D grid having a plurality of grid points (*figure 4B; it would have been obvious that the 3D volume displayed in figure 4B was composed from 2D grids. It would have been obvious to the ordinary artisan that even each cell of the 3D volume is composed from 2D grids, where each face of the 3D volume cube is a 2D grid.* ***Further, in a normal computer program, a 3D grid is made of 2D grids, as described in U.S. Patent Number 5,537,641, column 1, lines 40 - 45***);

ii. ***the computing device also defines a region of 3D space using the 2D grids*** (*figure 4B; it would have been obvious that a region of 3D space was defined using 2D grids*);

w. Therefore, as discussed above, it would have been obvious to the ordinary artisan at the time of invention to use the art of Stam with the art of Gamito to produce the claimed invention.

9. **Examiner's Note:** Examiner has cited particular columns and line numbers in the references applied to the claims above for the convenience of the applicant. Although the specified citations are representative of the teachings of the art and are applied to specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested from the Applicant in preparing responses, to fully consider the references in their entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the Examiner.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to the applicant's disclosure:

a. Da Vitoria Lobo (U.S. Patent Number 5,537,641) teaches that a 3D grid is composed of 2D grids.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Russ Guill whose telephone number is 571-272-7955. The examiner can normally be reached on Monday - Friday 9:30 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Any

inquiry of a general nature or relating to the status of this application should be directed to the TC2100 Group Receptionist: 571-272-2100.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Russ Guill
Examiner
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RG

4/12/07

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